

**WHAT IS CLAIMED IS:**

- 1        1. A method of defining a phase shifting mask, the method  
2 comprising:
  - 3                defining critical poly regions and adjoining poly, the critical  
4 poly regions being regions desired to be defined by phase shifting;
  - 5                creating phase regions on either side of the critical poly  
6 regions;
  - 7                assigning phase angles to the phase regions such that the  
8 phase regions have either a first phase angle or a second phase angle;
  - 9                defining edges of the phase regions being assigned the  
10 second phase angle, the edges not defining a poly pattern;
  - 11                defining a boundary region around the defined edges; and  
12                defining regions outside a desired poly pattern, phase  
13 regions, and boundary region to have the first phase angle, wherein the  
14 desired poly pattern, phase regions, and boundary region define a mask.
- 1        2. The method of claim 1, further comprising enhancing the  
2 phase regions assigned a phase angle.
- 1        3. The method of claim 1, wherein enhancing the phase regions  
2 assigned a phase angle includes reducing the effect of transition regions  
3 by moving transition regions away from the critical poly regions.
- 1        4. The method of claim 1, wherein the first phase angle and the  
2 second phase angle of the phase regions are assigned phase angles 180  
3 degrees from each other.
- 1        5. The method of claim 1, wherein the step of defining a  
2 boundary around the defined edges includes defining a boundary around  
3 edges having phase 180.

1       6.     The method of claim 1, wherein the step of defining a  
2     boundary around the defined edges comprises forming a chrome path.

1       7.     The method of claim 1, further comprising defining break  
2     locations where phase transitions are most likely to occur.

1       8.     The method of claim 7, wherein the break locations have a  
2     width that permits patterning and inspection.

1       9.     The method of claim 1, further comprising generating a trim  
2     mask to remove undesired patterns between regions of the first phase  
3     angle and the second phase angle.

1       10.    A method of generating phase shifting pattern to improve the  
2     patterning of gates and other layers needing sub-nominal dimensions, the  
3     method comprising:

4               defining critical areas;  
5                creating phase areas on either side of the critical areas;  
6                assigning opposite phase polarities to the phase areas on  
7     each side of the critical areas;  
8                enhancing phase areas with assigned phase polarities;  
9                defining break regions where phase transitions are likely to  
10    occur;  
11               generating polygons to define other edges and excluding the  
12    defined break regions;  
13               merging the generated polygons with enhanced critical gate  
14    areas having a common phase polarity;  
15               separating the polygons having interactions with more than  
16    one polarity into portions which are merged into regions having only one  
17    polarity;

18 constructing a boundary region outside of phase 180

19 regions; and

20 defining undefined regions as phase 0 regions.

1 11. The method of claim 10, further comprising:  
2 correcting design rule violations; and  
3 applying optical proximity and process corrections to phase  
4 regions to allow proper pattern generation.

1           12. The method of claim 11, further comprising generating a trim  
2 mask to remove undesired patterns between phase 0 and phase 180  
3 regions outside of a desired pattern.

1           13. The method of claim 12, wherein the generating is done by  
2       oversizing boundary and break regions.

1           14. The method of claim 10, wherein the break regions are about  
2 a minimum width of a desired poly pattern.

1 15. The method of claim 10, wherein enhancing critical areas  
2 with assigned phase polarities includes adding edges to the critical areas.

1        16. A method of enhancing clear field phase shift masks with a  
2 border around outside edges, the method comprising:  
3                assigning phase polarities to phase regions;  
4                defining edges of the assigned phase regions;  
5                establishing a boundary around the added edges; and  
6                assigning area outside of the established boundary to have  
7 phase zero.

1        17. The method of claim 16, wherein defining edges of the  
2 assigned phase regions includes defining break regions where phase  
3 transitions occur and generating polygons including edges but excluding

4 break regions, wherein the polygons are merged with the assigned phase  
5 regions.

1 18. The method of claim 17, further comprising curing design  
2 rule violations and applying correction procedures.

1 19. The method of claim 17, further comprising generating a trim  
2 mask to remove undesired patterns between phase 0 and phase 180  
3 regions.

1 20. The method of claim 19, wherein the generating is done by  
2 oversizing the boundary and break regions.

1 21. A integrated circuit formed by a process comprising:  
2 defining phase areas including adjoining poly areas located  
3 proximate to critical areas;  
4 assigning a first phase angle to the phase areas;  
5 defining remaining poly edges as part of the phase areas;  
6 defining a boundary around the defined phase areas, the  
7 areas outside the boundary being assigned a second phase angle, wherein  
8 the phase areas, the boundary, and areas outside the boundary defining a  
9 mask, wherein the first phase angle and the second phase angle are  
10 different;  
11 curing violation areas and applying correction procedures to  
12 appropriate areas on the mask; and  
13 patterning a structure on the integrated circuit using the  
14 mask.

1 22. The integrated circuit formed by the process of claim 21,  
2 wherein the second phase angle is zero.